

the timing for executing the MIL control operation (III) needs to be adjusted in view of the timing for executing the malfunction judgment (I) of the diagnosis target. If any diagnosis target needs to be changed, this will constitute a factor that lengthens the time required for changing the MIL controller module.

(3) Furthermore, the logic for executing the MIL control operation (III) is constructed to control the MIL based on the result of the adjustment and to provide a final control instruction for instructing a control operation of the corresponding MIL, such as flashing, lighting-on or lighting off, based on vehicle information. Thus, the logic for executing the MIL control operation (III) is generally not dependent on the type of diagnosis target and is generally not required to be changed when the diagnosis target is changed. On the other hand, when the vehicle information is changed, only the logic for executing the MIL control operation (III) is required to be changed.

However, since the MIL controller module disclosed in the above publication is modularized to conduct the series of the processes (I)-(III), so that reusability of the MIL controller module is relatively low.

A reusable program structure for executing the malfunction judgment (I) of the diagnosis target has been disclosed in Japanese Patent Application No. 2000-130180 (corresponding to U.S. Patent Application No. 09/840,877), which is incorporated herein by reference. Thus, the present invention is particularly

focused on modularization of logic for executing the adjustment (II) of the result of each malfunction judgment and logic for executing the MIL control operation (III) conducted based on the result of the adjustment.

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SUMMARY OF THE INVENTION

The present invention addresses the disadvantages discussed in the above sections (1)-(3), and it is an objective of the present invention to improve reusability of a self-diagnosis program that implements an MIL control operation in a case of specification change, such as change of a diagnosis target.

To achieve the objective of the present invention, there is provided a vehicular control device having a self-diagnosis function for informing occurrence of abnormality in at least one diagnosis target by controlling at least one malfunction indicator light (MIL) based on a result of a malfunction detection operation of each one of the at least one diagnosis target. The vehicular control device has an object oriented self-diagnosis program stored therein for implementing the self-diagnosis function. The object oriented self-diagnosis program includes at least one malfunction-information storing object and a malfunction-information managing object. The at least one malfunction-information storing object specifies a control instruction for instructing a control operation of the at least one MIL with respect to malfunction information of the each one of the at least one diagnosis target based on the

malfunction information of the each one of the at least one diagnosis target. The malfunction information of the each one of the at least one diagnosis target is determined based on the result of the malfunction detection operation of the each one of the at least one diagnosis target in view of a level of malfunction of the each one of the at least one diagnosis target. The malfunction-information managing object carries out adjustment of the control instruction of the at least one MIL specified by the at least one malfunction-information storing object based on the malfunction information of the each one of the at least one diagnosis target and outputs MIL information for controlling the at least one MIL based on a result of the adjustment of the control instruction of the at least one MIL.

In place of the above object oriented self-diagnosis program, there may be provided an object oriented self-diagnosis program including a malfunction-information managing object that outputs MIL information for controlling the at least one MIL when a request for controlling the at least one MIL is received. The request for controlling the at least one MIL is different from a request for executing the malfunction detection operation of the each one of the at least one diagnosis target.

Also, in place of the above object oriented self-diagnosis program, there may be provided an object oriented self-diagnosis program including a malfunction-information managing object that outputs MIL information for controlling the at least one MIL, and an MIL controlling object for controlling the at least one MIL based on the MIL information outputted from the